

Meso-scale precipitation systems and their role in the rapid development of a monsoon depression over the Bay of Bengal

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We investigate the three-dimensional structure of meso-scale precipitation systems in the different stages of the life cycle of a monsoon depression using observational data from multi-satellite sensors (e.g., GPM/GMI, GPM/DPR, CloudSat/CPR, etc.) and a cloud-resolving regional model. Effects of latent heating from the precipitation systems and the Bay of Bengal (BoB) on the development of the monsoon depression are also evaluated in sensitivity experiments with the model. A typical monsoon depression developed on 17 August 2016 over the BoB. In the rapid development phase, satellite observations reveal meso-scale convective systems with deep convective precipitation cells and stratiform precipitation near the head of the BoB. Extremely deep and intense convective cells appear along a ring-like rainband when a closed cyclonic circulation becomes obvious around the northernmost part of the BoB. The deep convections appear frequently, particularly along the western-to-southwestern side of the low. Sensitivity experiments reveal that both cloud/precipitation processes and evaporation from the BoB are essential for the rapid development of the monsoon depression over the BoB. A possible positive feedback process including moist convection that leads to the rapid intensification of monsoon depressions over the BoB is discussed.